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Results of Aseptic Celiotomy

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## RESULTS OF ASEPTIC CELIOTOMY.

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THE fact that I have had no death in abdominal and pelvic surgery for nearly two years, though I have operated on many cases and have declined to operate on none where surgery could promise relief, suggests to me that probably some of the previous bad results of my operations were due to an imperfect knowledge of the topographical anatomy of the abdominal and pelvic viscera, or of the pathological conditions for which celiotomy is indicated, or of the best methods of operating and preventing accidents, complications, or sequelæ. Many of the bad results in celiotomy could be prevented were this work done by men thoroughly prepared to give their patients all the protection that surgery offers. No one should attempt to open the abdomen until he is familiar with the anatomy and the normal relations of every abdominal and pelvic structure, and with the pathological conditions that may be encountered, and with the correct technique before and during the operation.

While we cannot make a positive diagnosis of the diseases for which celiotomy should be performed, we can usually do so with sufficient accuracy to indicate the necessity for an operation; and if we understand the best methods of treating all conditions that may be encountered our results will be good, provided we neglect nothing in the interest of the patient. Of course some operators are more expert than others, but there are very few who do not possess enough mechanical skill to do successful surgery if they become otherwise masters of their specialty.

We are sometimes surprised at the bad results of men who apparently do good surgery, but if we will study the details of their work we will find that something is lacking; and unless the details are attended to in every particular bad results may be expected. I may be taken to task for saying that there are

relatively few men who are surgically clean, but I make the assertion because I hear of deaths resulting from sepsis in cases where the poison was carried to the patient by the operator or his assistants, or on something used in the operation, for there was no pus or matter of any character in the structures removed that could have contained pathogenic germs. It may be claimed that sepsis was caused by the germs in the atmosphere; but this is nonsense, unless the operations were done in a room where there had recently been some infectious disease. If atmospheric infection causes sepsis in celiotomy, it is so infrequent as to be practically not worth considering. While I would not operate in a room recently occupied by a patient with an infectious disease, or allow any person at the operation who had been in recent contact with an infectious disease, still I am not positive that it might not be done with impunity if we bring nothing in contact with the peritoneum that has poisonous germs upon it. Infection is almost invariably the result of contact, unless there is some virulent accumulation within the abdomen or pelvis that cannot be removed without soiling the peritoneum. The germs are carried to the patient on the hands of the operator, assistants, or nurses, or by the sponges, water, instruments, ligatures, or other things used in the operation, and no one will have uniformly good results who does not supervise everything connected with the operation; or, if he cannot do this himself, he should have some one do so in whose honesty, fidelity, and ability he has implicit confidence.

In reviewing my early experience I recognize that I did not observe all the details in such a way as to give the patient the best chances against infection, and I have learned the necessity of knowing personally that everything is correctly done.

I will briefly detail some of the methods observed in my celiotomy work in the gynecological operating room at St. Joseph's Infirmary.

No one assists in the sterilization of gauze, sutures, instruments, dressings, etc., except my assistant, Dr. Frank, who has been practically trained for such work by several years' experience here and abroad; and my head nurse, who assists in nearly all my operations. Especial care is taken after sterilization to prevent reinfection, which may occur if instruments, etc., used in the operation are handled with unclean hands or come in contact with anything unclean. Every one who has



anything to do with sterilization or with the operation is required to be bathed and dressed in clean linen, to wear linen gowns that cover nearly the entire body, to have the hands washed with green soap and hot water with sterilized brushes, and afterward washed in a 1:1000 solution of bichloride of mercury. This, if done properly, makes the hands practically sterile, and there is no necessity for putting the hands in solutions of permanganate of potash and oxalic acid, for the bacterial spores, if any are left, will be so embedded in the surface layer of the skin that they cannot, probably, infect anything. The assistants and the nurses are usually inspected, to see if the finger nails have been trimmed and cleansed and if the hands have been correctly sterilized. By taking these precautions, sterilization in Arnold's or any approved sterilizer may be so perfect that a pathogenic culture cannot be made from the instruments, sutures, towels, gauze, etc., used in the operation. This has been tested by Dr. Frank in the bacteriological laboratory at the Kentucky School of Medicine, and I now have but little concern about infecting patients, unless there is a pus tube, or something containing septic matter, that cannot be removed from the pelvis or abdomen without soiling the peritoneum, and of course this will rarely occur in the practice of a successful operator.

The instruments are washed with sapolio with a sterilized brush, and all unclean matter is removed, especially in the openings where the blades are joined and in the eyes of the needles. They are dipped in boiling water, wiped dry, wrapped in a sterilized towel, and put away. The water used in sterilization, in washing instruments, sponges, and during the operation, has been filtered through a Pasteur filter and boiled. The towels are used for no other purpose, and are washed separately from other clothing and boiled in clean water for half an hour. Everything used, except the sponges and kangaroo tendon, is sterilized for an hour, just before the operation, in an Arnold's sterilizer in the operating room, and taken out when needed at the beginning of and during the operation. The silk for ligatures and sutures, three sizes, is loosely wound on glass spools as a convenience during the operation, and is wrapped in gauze with the silkworm gut and the needles. The instruments known to be necessary in the operation are wrapped in one towel, and those that may be necessary in the treatment of any condition that

may be encountered are wrapped in another, to be held in reserve, so that no imperfect preparation shall delay the operation.

Sponges are used, but gauze, or absorbent cotton wrapped in gauze, may be made sterile; and, unless the operator supervises the preparation of his sponges, the latter may be preferable. The sponges are carefully selected, well shaped, of soft texture, as free as possible from calcareous matter or dirt. They are thoroughly beaten with a wooden mallet on a hard, smooth surface, after which they are carefully washed in cold water and put for twelve hours in water made disagreeably sour with hydrochloric acid. The acid is washed out of them, and they are kept for six hours in a mixture of sulphurous acid one part and water five parts, when they are again washed and put in a large glass-stoppered, sterilized jar or bottle filled with alcohol. They are now aseptic, and will remain so indefinitely if not reinfected by carelessness in removing them from the alcohol.

As it is impossible to know in just what cases irrigation or drainage may be necessary, glass irrigation and drainage tubes, gum dam and tubing, and everything used for such purposes are put in the sterilizer.

The operating room is well ventilated and the floor and walls are kept clean, and some hours before the operation the dust is wiped off of everything in the room with a damp towel. The spray is not used, because it is of no practical value, and if the atmosphere in the room is surcharged with an irritating germicide it might act injuriously upon the peritoneum or the kidneys. It is well to have the atmosphere in the room moist, but this is accomplished by the sterilization that is continued during the operation.

No patient is operated upon until the urine has been analyzed for albumin, casts, and sugar. I do not operate on patients markedly diabetic, unless the disease for which the operation is indicated would otherwise prove rapidly fatal. Albumin in the urine is not a contra-indication, because it is often caused by pressure, and when this is removed there is no further trouble. And frequently casts are produced by the same cause; but if they are abundant, indicating extensive nephritis, the operation is delayed, unless there is an immediate necessity for it or unless it offers the only hope of recovery. I recently insisted upon the removal of a large ovarian cyst in a feeble old woman with thirty-three per cent of albumin by volume in the urine, and



casts abundant, because she could not live long without an operation and was entitled to the benefit of it. Ether is not given where there is nephritis.

Nourishing, but mostly liquid, diet is given for two days before the operation, but nothing for several hours before it. The patient is well purged, so as to remove fecal matter and gas that would otherwise distend the bowels and interfere with the operation and with the after-treatment. The operation is usually done at 3 o'clock P.M., and the last purgative is ordered the night preceding, so that it may cease to act some hours before the anesthesia is given. An opiate is seldom given, but where the inhibitory powers are weak a hypodermic injection of thirty minims of tincture of digitalis and one-fifteenth of a grain of sulphate of strychnia is given just before the operation. A hot bath with green soap and brush is given by the nurse the evening before the operation, and another at 11 o'clock the next day, and at each bath the vagina is irrigated, and, if preparing for a hysterectomy, a bichloride solution 1:4000 is used. After the second bath the patient is dressed in clean linen, put to bed, and the abdomen covered with a towel wet in a 1:1000 bichloride solution. Thirty minutes before the operation the abdomen and pubes are shaved and again washed, then bathed in ether or alcohol, and the bichloride applied. This is repeated after the patient is on the operating table. This removes all the pathogenic bacteria from the skin that could infect the hands, sponges, or instruments, and does away with the necessity of covering the sides of the abdomen with sterilized towels or gauze. The patient is put on a plate-glass-top table with a Kelly's ovariectomy pad adjusted, and the limbs and body, except the abdomen, wrapped in clean blankets or sheets, which are covered with sterilized towels so that nothing unclean will be touched.

In preparing for a hysterectomy, after irrigation as above, the walls of the vagina and the neck of the womb are washed with soap and water with gauze or absorbent cotton, bathed well with a 1:2000 bichloride solution, wiped dry, and packed with iodoform gauze. This is repeated just before the operation.

In vaginal hysterectomy for carcinoma the uterus is curetted a few days before the operation and all necrosed tissue removed, and, after careful sterilization, its cavity and the vagina tamponed with iodoform gauze. After the patient is on the operating table the curetting is repeated and the vagina again sterilized,

for death may otherwise occur from septic infection caused by the germs in the diseased tissue of the uterus.

All the furniture in the room is free of carving, with no irregularities to catch dirt, and has the highest cabinet finish, so that it may be easily kept clean, as may also the glass-top operating table and the marble and plate-glass tops of the tables for the operator and the nurse.

The vessels for boiling and holding water, and the pans for the operating room, are metal, white porcelain lined, and are used for no other purpose, so that they are free of infectious matter.

Just before the abdominal incision is made the hands of the operator, his assistants, and the nurses are bathed in the bichloride solution, which is immediately washed off in hot water. No germicide solutions are used upon anything that comes in contact with the cut surface of the abdomen or with the peritoneum, and they have no place in the operating room other than to aid in sterilization before the operation; for if the technique has been so imperfect that infectious matter is on anything used in the operation the germicide will not sterilize it, and, if brought in contact with the peritoneum, will have a destructive action upon its endothelial layer, which will destroy in a degree its resisting power against the invasion of pathogenic germs, and may also cause extensive adhesions. The truth of this assertion has been proven by the experiments and observations of the most correct workers in this line of investigation, and I am so positive that germicides should not come in contact with the peritoneum that I do not use gauze for drainage with iodoform, bichloride of mercury, or carbolic acid on it, nor do they afford any additional protection if the gauze has been sterilized by heat.

The hands of the operator and of every one assisting are kept clean by being constantly dipped in hot water. If a sponge touches anything not positively clean, or becomes soiled with pus or matter probably septic, it is immediately thrown away. Plenty of sponges are held in reserve, but not more than from three to six are generally used in an operation, and as few instruments as possible.

The operation is frequently performed without using a hemostatic forceps to control hemorrhage. All the simplicity is introduced consistent with good surgery, for a multiplicity of



technique is unnecessary and confusing. The operation is performed as rapidly as possible, but never hurriedly, so as to prevent traumatism of the abdominal and pelvic viscera, which too often causes serious complications or death if the operator is inexperienced or careless. During the last two years I have frequently separated extensive and firm intestinal adhesions without injuring the bowel, and have not ruptured a pus tube, though I have enucleated them in complicated and difficult cases. Hemorrhage has been easily controlled by ligating everything necessary to prevent it, being careful to include the proximal and distal ends of the ovarian artery. A failure in this particular is the most frequent cause of fatal hemorrhage, which should be prevented if ligation is correctly done with a hard twist or plaited silk ligature, relatively small, but strong enough to thoroughly constrict the enclosed tissue, and enough of the pedicle is left to prevent slipping. The pedicle is inspected before closing the abdomen, and the cavity examined by dipping a sponge into the pouch of Douglas to see if there is hemorrhage except oozing; for if these precautions are not observed fatal hemorrhage may occasionally occur. There is especial danger of this accident where extensive adhesions have been separated, or many ligatures applied upon the broad ligaments in hysterectomy, and in varicose veins with thin walls in the pedicle of an ovarian tumor, easily torn if tension has been too great before or after its ligation.

I recently had a rupture of a large vein below the ligature which would have caused death in a little while had not a separate ligature been applied; and I have frequently encountered extensive and firm adhesions of the omentum that could not be separated without so lacerating this structure as to necessitate the removal of the greater portion of it, but no untoward symptom has resulted. If the peritoneum has been soiled with anything probably septic, it is thoroughly cleansed by carrying the water through a glass irrigation tube into every part of the pelvis and abdomen; but this is not necessary if the peritoneum has been soiled with nothing but blood, unless there are clots that cannot be otherwise removed.

Drainage is never used unless pus or septic matter has soiled the cavity or there is extensive oozing, and vaginal drainage is not used except in pelvic abscess or hysterectomy for cancer. A very small and light glass tube, open at the bottom, with fine

holes upon the sides extending within two inches of its mouth, is used. This is necessary, because while the blood and secretions usually gravitate into the pouch of Douglas or into the deepest part of the pelvis, this is not uniform; for in one instance I could get but little liquid out of the tube until it had been pulled up two inches, and then drew away a pint which had accumulated between the intestines and the abdominal wall. This may be unusual, but as it does occur it is a wise precaution to have the openings in the tube extend nearly to the abdominal wall. I was formerly much opposed to draining with gauze, except in pus cavities where the surrounding walls could not be entirely removed, but recent experience has convinced me that there is nothing that drains so effectively or gives as perfect protection; and if the gauze is correctly sterilized it is less likely to carry infection than the tube, from which the blood and secretions are removed by suction or by the frequent introduction and removal of small strips of gauze. All the liquid in the peritoneal cavity is removed more rapidly and more thoroughly if a large piece of gauze is placed at the lower angle of the wound and down to the bottom of the pelvis; and if drainage is a means of preventing infection it is because of the removal of secretions that would otherwise furnish a medium in which pathogenic bacteria would develop and multiply. I have just discharged a patient in whose case a glass tube was used, but I placed between the tube and the intestines a thick piece of gauze, which remained in the cavity for three days before disturbing it; and while the patient made an uninterrupted recovery from a most dangerous condition, I believe she would have died had I depended solely upon the tube.

The only fixed rule that has governed me in closing the abdominal incision is to bring the several layers of the walls together in the manner that best insures union by adhesion and prevents suppuration, otherwise ventral hernia may follow. This is better accomplished by suturing the peritoneum, fascia, and muscles separately with the buried suture, using sterilized kangaroo tendon, catgut, or silk; but suppuration will then occur unless the divided tissues and the adjacent skin are practically aseptic. While it is impossible to make the tissues absolutely aseptic, the few bacterial spores in the wound or skin will not develop into pathogenic germs, because of the resisting powers of the cellular elements, unless the sutures be so tightly drawn



as to partially cut off the normal blood and nerve supply. The buried suture has not been used in drainage cases, but the incision has been united with an interrupted silk or silkworm-gut suture so introduced as to best approximate the edges of the fascia. Sometimes the incision is entirely united with the buried suture by the continuous or the cobbler's stitch; again by interrupted sutures through the entire walls, but, before tying them, separately suturing the peritoneum and fascia, or separately suturing the peritoneum and fascia and then closing the open wound by superficial interrupted sutures.

If the sutures are all buried the wound is dressed with iodoform-collodion, otherwise with iodoform, and many thicknesses of gauze held tightly by a flannel binder so fastened by straps around the legs as to prevent slipping. If no drainage is used the dressing is not disturbed for six or seven days, and then the surface is cleansed and the interrupted sutures removed. In drainage cases the dressings are removed and replaced when soiled, and always removed and the wound redressed when the tube or gauze is taken out. In these cases I introduce one or two provisional sutures to be tied, and close the opening when the tube or gauze is removed.











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